UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/558,917	08/29/2006	Michael S. Wong	1789-12702	8501

23505 7590 12/31/2008

CONLEY ROSE, P.C.
David A. Rose
P. O. BOX 3267
HOUSTON, TX 77253-3267

EXAMINER
JOHNSON, KEVIN M

ART UNIT	PAPER NUMBER
1793	

NOTIFICATION DATE	DELIVERY MODE
12/31/2008	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

pathou@conleyrose.com

Office Action Summary	Application No.	Applicant(s)	
	10/558,917	WONG ET AL.	
	Examiner	Art Unit	
	KEVIN M. JOHNSON	1793	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *08 December 2008*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-5,7-12 and 19-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-5,7-12 and 19-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Status

1. Claims 1 and 8 have been amended. Claim 6 has been cancelled. New claim 28 has been added. Claims 1-5, 7-12 and 19-28 are pending and presented for examination.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The claim requires that the gel structure produced in step (d) of claim 1 is an aerogel or xerogel. It is generally accepted that aerogels may only be formed through a supercritical drying process. As a result it appears that the gel produced in step (d) of claim 1 can not be an aerogel, as claim 1 has been amended to require that the gel is formed by drying the precursor solution in air at about room temperature. Air drying a solution at room temperature would not qualify as supercritical drying. For the purposes of examination the claim has been interpreted as requiring the gel to be a xerogel.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and

> the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

6. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

7. Claims 1-5, 7-12, 19-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wong et al. (Nano Letters, 2001, Vol.1, No. 11, p 637-642) in view of Brinker et al. (Adv. Mater. 1999, 11, No. 7, p 579-585) and Burlitch (US 5019293).

In regard to claim 1, Wong teaches a method of producing mesoporous metal oxides using nanoparticle precursors. The method comprises preparing a colloidal nanoparticle sol and a solution of a surfactant and a tungstate salt, mixing the solutions to form a precipitate, drying the material and then the removal of the pore-forming agent

from the dried material (column 1, p 638). The solution taught by Wong is clear until the formation of precipitates (column 1, p 638). Wong fails to teach that the solution of the nanoparticles, surfactant and tungstate salt is clear.

Brinker teaches that an evaporation induced self-assembly process. The process involves forming a solution that contains a surfactant and a precursor to the desired mesoporous material, and then drying the solution to induce the self-assembly of a gel structure (p 580). Brinker teaches examples of surfactant-soluble silica mixtures that are dehydrated to form organic-inorganic mesophases as part of a dip-coating process (p 580). This process is especially suited to the formation of thin films of the mesophase on a substrate in a way that was not possible in previous synthesis processes (p 579). Brinker fails to teach that the drying step is carried out in air at room temperature.

Burlitch teaches that it is common as part of a dip-coating process to air-dry coatings produced by a dip-coating process. Burlitch is silent as to the temperature at which the air-drying occurs, and therefor the temperature is considered to be ambient/room temperature.

It would have been obvious to one skilled in the art at the time of the invention to alter the solution in the process taught by Wong to utilize an evaporation induced self-assembly (EISA) process as taught by Brinker that incorporates a room-temperature air-drying step. Such a modification would have been motivated by the teaching in Brinker that an EISA process is uniquely suited for use in a sol-gel dip-coating process (column 2, p 580), the teaching in Wong that the process used is analogous to the production of

silica mesoporous materials like those produced in Brinker (column 1, p 637), and the teaching in Burlitch that dip-coatings are commonly air-dried. Utilizing a dip-coating process would allow the material produced by Wong to be used in applications that require a supported catalyst, improving the industrial applicability of the material. It would have been further obvious to one skilled in the art at the time of the invention that the solution of the surfactant, tungstate salt and nanoparticles taught by Wong would be clear when the formation of a precipitate is avoided.

In regard to claim 2, Wong teaches that the catalytic precursor component is a tungstate salt (column 2, p 637).

In regard to claim 3 and 24, Wong fails to teach the use of a cationic, anionic or zwitterionic surfactant. However, Wong does teach that the nonionic surfactants associate with an H+ ion, and therefore acts in a manner similar to a cationic surfactant (column 2, p 640).

Brinker teaches the use of the cationic surfactant cetyltrimethylammonium bromide (CTAB) as a pore-forming and structure directing agent (column 2, p 580).

It would have been obvious to one skilled in the art at the time of the invention to substitute CTAB for the pluronic P123 surfactant used by Wong in the synthesis of the mesoporous metal oxide. This would have been motivated by the teaching of Wong that the nonionic surfactant used bonds with a hydrogen ion to achieve a positive charge (column 2, p 640), allowing it to act in a similar manner to cationic surfactants, and the suggestion that other types of surfactants could be used (column 2, p 641).

In regard to claim 4, Wong teaches a method of producing a mesoporous metal oxide catalyst where instead of using pre-formed nanoparticles, a precursor salt was added to the surfactant solution (Column 1, p 641).

In regard to claim 5, Wong teaches the use of zirconium oxide (column 1, p 638), titania (column 2, p 640) and alumina nanoparticles (column 1, p 641).

In regard to claim 7, the metal salt utilized by Wong as a catalyst precursor is ammonium metatungstate (column 1, p 638).

In regard to claim 8, while Brinker fails to teach that the gel structure produced is a xerogel, it would have been obvious to one skilled in the art at the time of the invention that the process used by Brinker would result in the formation of a xerogel. A xerogel is the result of the unconstrained drying of a gel. The process taught by Brinker does not seek to constrain the drying of the gel in any way, and therefor must result in the production of a xerogel.

In regard to claim 9 and 11, Wong teaches that the material is completely amorphous (column 2, p 638).

In regard to claim 10, it would have been obvious to one skilled in the art at the time of the invention that due to the surface area of 130 m^2/g and WO_3 loading of 30.5 wt-% taught by Wong, the surface density of the tungsten oxide on the zirconia would be approximately 6.0 molecules/nm^2. It is known in the art that the monolayer surface density of tungsten on a zirconia support is 4 molecules/nm^2, and therefore the surface density of the material produced by Wong exceeds the monolayer surface density of the catalytic component.

In regard to claim 12, Brinker teaches that as a result of an EISA process organic and inorganic polymerization take place to complete the assembly process (column 2, p 582). It would be obvious to one skilled in the art at the time of the invention that the inorganic polymerization taught by Brinker would affect the inorganic catalyst precursor taught by Wong.

In regard to claims 19-23 and 25-26, the surfactant used by Wong is a nonionic poly(ethylene oxide)-poly(polypropylene oxide)-poly(ethylene oxide) triblock copolymer of the form $EO_{20}PO_{70}EO_{20}$ in conjunction with zirconium oxide nanoparticles and a catalytic component comprising tungsten.

In regard to claim 27, Wong teaches that the material is calcined to remove the pore-forming agent (column 1, p 638).

8. Claim 28 is rejected under 35 U.S.C. 103(a) as being unpatentable over Wong, Brinker and Burlitch as applied to claim 1 above, and further in view of Winter (US 3907921).

In regard to claim 28, Wong, Brinker and Burlitch fail to teach that the porous catalyst is impregnated with an additional catalyst precursor or non-surfactant polymer.

Winter teaches that it is well known in the art to impregnate porous materials with catalyst precursors to improve the catalytic function of the porous material (column 3, lines 46-58).

It would have been obvious to one skilled in the art at the time of the invention to impregnate the porous material obviated by the teachings of Wong, Brinker and Burlitch with a catalyst precursor. This modification would have been motivated by the teaching

in Winter that it is well known in the art that impregnating catalyst precursors in to porous materials improves the catalytic performance of the material (column 3, lines 46-58).

Response to Arguments

9. Applicant's arguments with respect to claims 1-5, 7-12 and 19-28 have been considered but are moot in view of the new ground(s) of rejection.

The new grounds of rejection have been necessitated by the amendment of the independent claim to include the limitation that the drying in step (d) of claim 1 is carried out in air at about room temperature.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to KEVIN M. JOHNSON whose telephone number is (571)270-3584. The examiner can normally be reached on Monday-Friday 7:30 AM to 5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jerry Lorengo can be reached on 571-272-1233. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/J.A. LORENGO/
Supervisory Patent Examiner, Art Unit 1793

/Kevin M Johnson/
Examiner, Art Unit 1793